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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/687,288	10/15/2003	Wang Yueh	42P17301	7538

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EXAMINER	
CHACKO DAVIS, DABORAH	

ART UNIT	PAPER NUMBER
1756	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/687,288	YUEH ET AL.	
	Examiner	Art Unit	
	Daborah Chacko-Davis	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 April 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *21-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *21-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 27, is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 27, recites that the non-chemically amplified photoresist layer does not includes a photo acid generator. The specification, on page 6, paragraph no. [0023], teaches the use of a non-chemically amplified photoresist that includes a photoactive compound which upon exposure to light generated or forms an acid i.e., the photoactive compound is a photoacid generator. There is no disclosure in the specification teaching that the non-chemically amplified generator does not include a photo acid generator (PAG). Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 21-25, 30-34, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,759,739 (Takemura et al., hereinafter referred to as Takemura) in view of U. S. Patent Application Publication No. 2005/0074699 (Sun et al., hereinafter referred to as Sun).

Takemura, in the abstract, in col 1, lines 10-13, in col 3, lines 30-37, in col 4, lines 3-14, in col 5, lines 1-24, in col 6, lines 66-67, in col 7, lines 1-30, discloses a process of patterning features on the substrate (super LSIs) by forming a photoresist layer on the substrate (integrated device to be fabricated), wherein the photoresist includes an alkali-soluble resin, and a photoacid generator (photoactive), exposing the photoresist layer to EUV (excimer radiations) such that selected portions (exposed portions) are rendered soluble in the developer (during the developing process) by the acid generated by the photoacid generator during exposure, and the unexposed portions are inhibited from being rendered soluble in the developer (claims 21, 24, 30, and 32). Takemura, in col 4, lines 3-6, discloses that the alkali-soluble resin is polyhydroxystyrene (claims 22, and 31). Takemura, in col 10, lines 43-47, discloses that the photoactive agent contains a phenyl group (claims 23, and 33). Takemura, in col 5, lines 20-24, discloses that the acid unstable group is a carbonyl group (claims 25, and 34).

The difference between the claims and Takemura is that Takemura does not disclose that the photoresist layer is non-chemically amplified.

Sun, in [0039], discloses that the chemically amplified photoresist layer can be replaced with a non-chemically amplified photoresist layer.

Therefore, it would be obvious to a skilled artisan to modify Takemura by replacing the photoresist layer of Takemura with a non-chemically amplified resist layer as suggested by Sun, because Sun, in [0039], discloses that the non-chemically amplified photoresist layer can be used for performing photolithographic processes in a shorter wavelength range (less than 365nm).

5. Claims 21, 26, 30, and 35, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,358,599 (Cathey et al., hereinafter referred to as Cathey) in view of U. S. Patent Application Publication No. 2005/0074699 (Sun et al., hereinafter referred to as Sun).

Cathey, in the abstract, in col 3, lines 36-68, and in col 4, lines 5-44, in col 6, lines 18-20, discloses a process of patterning a semiconductor device in a lithography tool, the device including a plurality of structural layers by forming a photoresist layer on the structural layers, wherein the photoresist includes a photoactive compound that prevents selected portions of the resist form being solubilized by the developer, exposing the resist to UV radiation, and said acid generator renders selected portions (unexposed non-crosslinked portion) of the resist soluble in the developer during the development step (claims 21, 30). Cathey, in col 4, lines 40-44, disclose that the resin is a poly vinyl phenol resin (claims 26, and 35).

The difference between the claims and Cathey is that Cathey does not disclose that the photoresist layer is non-chemically amplified.

Sun, in [0039], discloses that the chemically amplified photoresist layer can be replaced with a non-chemically amplified photoresist layer and can be used to perform exposures in less than 365nm (shorter wavelengths that includes EUV).

Therefore, it would be obvious to a skilled artisan to modify Cathey by replacing the photoresist layer of Cathey with a non-chemically amplified resist layer as suggested by Sun, because Sun, in [0039], discloses that the non-chemically amplified photoresist layer can be used for performing photolithographic processes in a shorter wavelength range (less than 365nm).

6. Claims 27-29, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,358,599 (Cathey et al., hereinafter referred to as Cathey) in view of U. S. Patent Application Publication No. 2005/0074699 (Sun et al., hereinafter referred to as Sun) as applied to claims 21, 26, 30, and 35, above, and further in view of U. S. Patent Application Publication No. 2004/0204328 (Zhang et al., hereinafter referred to as Zhang) and U. S. Patent No. 6,261,738 (Asakura et al.,hereinafter referred to as Asakura).

Cathey in view of Sun is discussed in paragraph no. 3.

Cathey, in the abstract, in col 3, lines 36-68, in col 4, lines 5-44, in col 5, lines 1-10, and in col 6, lines 18-44, discloses a process of patterning a semiconductor device in a lithography tool, the device including a plurality of structural layers (metal layers), patterning the photoresist layer formed on the structural layers to form a photoresist etch mask, wherein the photoresist etch mask is used to etch the exposed structural

layers underlying the mask, followed by stripping the remaining photoresist mask (claim 28).

The difference between the claims and Cathey in view of Sun is that Cathey in view of Sun does not disclose that the patterns formed in the device have a critical dimension of approximately 15 nm. Cathey in view of Sun does not disclose that the photoresist does not include a photoacid generator (claim 27). Cathey in view of Sun does not disclose that the line wide roughness of the feature is less than 2 nanometers (claim 29).

Zhang, in [0019], discloses that the features formed in the device have a critical dimension less than 2nm, and a line width roughness of less than 2nm, and that the line width roughness is within 8% of the critical dimension.

The difference between the claims and Cathey in view of Sun and Zhang is that Cathey in view of Sun and Zhang does not disclose that the photoresist does not include a photoacid generator.

Asakura in col 1, lines 15-36, discloses that the non-chemically amplified photoresist does not have a photoacid generator.

Therefore, it would be obvious to a skilled artisan to modify Cathey in view of Sun by employing the method of patterning taught by Zhang, because Zhang, in [0019], discloses modifying the photoresist formulation and adjusting the latent image results in a pattern of reduced roughness. It would be obvious to a skilled artisan to modify Cathey in view of Sun and Zhang by employing the acid donors suggested by Asakura in the composition because Cathey discloses the use of a photo active compound in the

composition and Asakura in col 1,lines 32-43, discloses that the claimed latent acid donors (photoactive compounds) are thermally stable and can be activated by light, UV or X-rays and can be used as catalyst in acid-catalyzed reactions.

Response to Arguments

7. Applicant's arguments, see newly added amendment and arguments, filed April 3, 2007, with respect to the rejection(s) of claim(s) 21-26, and 30-35, under 35 U. S. C. 103 (a), have been fully considered and are not persuasive. Therefore the rejections of Takemura in view of Sun, and Cathey in view of Sun are maintained. Applicant's arguments, see Remarks, filed April 3, 2007, with respect to newly filed claims 27-29 have been fully considered and are persuasive. Therefore, the rejection (Cathey in view of Sun and Zhang) has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made further in view of U. S. Patent No. 6,261,738 (Asakura).

A) Applicant argues that neither Takemura nor Sun nor Cathey teach or suggest the particular non-chemically amplified photoresist recited in claims 21, and 30.

Takemura and Cathey are depended upon to disclose the particular resist layer formed on the film layer. Although Takemura and Cathey does not refer to the resist layer as non-chemically amplified, both Takemura and Cathey teach a resist layer that has the same components of the resist layer recited in claims 21, and 30. Takemura and Cathey teach that he photoresist includes a resin, and photoactive compound, wherein the photoactive compound generates acid upon exposure to light. Sun is

merely depended upon to disclose the interchangeability and/or replaceability of a chemically amplified with a non-chemically amplified resist layer.

B) Applicants argue that neither Cathey nor Sun discloses performing exposure in EUV wavelengths.

Cathey teaches the same photoresist compositional elements as that recited in claims 21, and 30. Cathey teaches performing exposure using UV radiations. However, Sun, in [0016], teaches that the same composition can be exposed in less than 500nm wavelengths such as 4nm, 11nm etc. i.e., EUV wavelengths.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dcd

June 23, 2007.

MARK F. HUFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700